

**DISC TYPE PADLOCK**

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**Reference To Related Application**

This application claims priority from U.S. Provisional Patent Application Serial No. 60/440,540 filed January 16, 2003, the content of which is incorporated herein by reference.

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**Field of the Invention**

This invention relates to padlocks and more particularly to a padlock in which the shackle moves in an arcuate path relative to the body of the padlock.

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**Background of the Invention**

Padlocks having shackles moveable in a circular or arcuate path are referred to as disc type padlocks and usually have a circular or disc shaped body with a notch in the circumference. The shackle which is arcuate or in the form of an open ring is completely concealed within the padlock body when in an open position and one end of the shackle extends to close the gap in the circular body near the circumference in a locked condition of the padlock. The gap at the circumference of the body is for the purpose of accepting the links of a chain or the eye of a hasp when the padlock is in an open or unlocked condition. The shackle is moved in an annular path through the operation of a key and

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tumbler mechanism to pass through a chain link or eye of a hasp to achieve the locked condition of the padlock.

The only connection between the open ring forming the shackle and the body of the padlock is the connection of the tumbler and the key with the shackle. As a consequence, both in its locked and unlocked condition, as well as during movement between those positions, the shackle tends to move laterally relative to the padlock body, often making a disturbing noise that causes the user to question the operation or integrity of the lock mechanism.

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### **Summary of the Invention**

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It therefore is desirable to reduce any relative lateral motion of the arcuate shackle relative to the body to give a more firm and smooth operation to movement of the shackle and to minimize friction and any operational noises that might be found disturbing as the parts move relative to each other during movement between locked and unlocked positions.

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It is an object of the invention to provide a disc type padlock in which the shackle is moveable between open and closed positions with a minimum of effort and in which the shackle is held firmly in position relative to the remaining parts of the padlock to eliminate noise or sounds of relative movement of the shackle and its body.

This and other objects of the invention are attained by a disc type padlock in which the open ring like shackle is provided with ball bearings that engage the walls of the padlock body to minimize any relative movement and contact and at the same time

afford smooth quiet moving action between locked and unlocked positions. For this purpose the ring like shackle is provided with ball bearings strategically located and concealed within the housing body in both the locked and unlocked condition to minimize friction between the moving shackle and the padlock body and to hold the shackle firmly in position relative to the padlock body to minimize noise of its relatively moving parts.

### **Description of the Drawings**

Figure 1 is a photograph illustrating the front side of a disc shaped padlock embodying the invention shown in its unlocked condition;

Figure 2 is a view similar to Figure 1 showing the padlock embodying the invention in its locked condition and with the outer circumferential portion in cross-section;

Figure 3 shows one side of the shackle separated from its supporting body; and

Figure 4 is a cross-sectional view at an enlarged scale taken on line 4-4 in Figure 2.

### **Detailed Description**

Referring to the drawings and particularly to Figures 1, a disc type padlock is designated generally at 10 and is provided with a recess or notch 12 which is open at the circumference of the disc shaped body 14 in the illustrated unlocked condition of the lock. Notch 12 is closed by a portion 15 of a shackle 16 as seen in Figure 1 in the locked

position of the lock 10. In that position the shackle portion 15 is intended to receive portions of items to be locked or disabled such as hasps or chain links.

This invention is concerned with the relationship of the shackle 16 to the body 14 of the padlock 10 and a detailed description of the workings of the padlock are not  
5 needed for an understanding of the invention. A more complete disclosure of such locking mechanisms can be found in U.S. Patent 4,998,423 to Hsu and U.S. Patent 5,921,123 to Schwarzkopf.

Basically the padlock 10 is comprised of the body 14 which typically is formed in two parts such as a front portion 18 and a back portion 20 as seen diagrammatically in  
10 Figure 4. The body portions are fastened together to form an internal annular groove 22 at the outer circumference of the circular body 14. The groove 22 is fitted with the shackle 16 which is slidably guided in the groove. Shackle 16 is in the form of an incomplete ring with a gap 24 between the opposite ends 26 and 28 as seen in Figures 2 and 3. In the locked position of the padlock 10 the portion 15 of shackle 16 closes the  
15 gap and the ends 26 and 28 of the shackle 16 are in a position shown in full line in Figure 2 within the body member 14. In the unlocked position the ends 26 and 28 occupy the position shown at 26' and 28' in Figure 2. The movement of the shackle 16 in its groove 22 is controlled by the lock mechanism (not shown) which is actuated by a key in a slot or keyway 30 indicated in Figures 1 and 2. The key typically operates a tumbler lock  
20 mechanism which engages the shackle 16 through a notch or the like 32 seen in Figure 3. The notch 32 is positioned in the shackle between the pairs of bearings 40 and diametrically opposite the gap 24. Movement of the key causes the lock mechanism to

move the shackle 16 between its open or unlocked position and its closed or locked condition.

In a preferred embodiment of the invention, the shackle 16 is provided with anti-friction bearing such as ball bearings 40. The bearings 40 are embedded in the surface of the shackle so that only a small surface portion protrudes to engage the walls of the internal groove 22 in the body 14 of the padlock 10. The bearings 40 are disposed in pairs to act against inner surfaces of groove 22. One pair of bearings 40 is disposed near the trailing end 28 of shackle 16. Another pair of bearings 40 are embedded in the surface of the shackle 16 in spaced relationship to the leading end 26 of the shackle 16 as best seen in Figure 3. The two pairs of bearings 40 are disposed in diametrically opposed relationship to each other to facilitate support and alignment of shackle 16 relative to the surfaces of groove 16.

From an examination of Figures 2, 3 or 4 it will be seen that the bearings 40 are positioned within the radially outer one half of the cross-section of the shackle 16. In that position the bearings 40 support the shackle 16 against lateral displacement.

When the lock is in its locked condition as illustrated in Figure 2 both pairs of bearings 40 are disposed within and protected by the housing or body member 14. Also, as seen in Figures 2 and 3, the two pairs of bearings 40 are disposed in substantially diametrically opposed relationship and act in opposition to each other and theoretically are the only points of contact of the shackle 16 with the interior walls of the internal groove 22. During movement of the shackle 16, the bearings 40 serve to minimize surface friction and to bring about a smooth action in addition to maintaining the shackle

16 in close fitting relationship to the internal walls of the housing 14 so that noise or sounds are minimized in the locked position and during movement of the shackle between its locked position seen in Figure 2 and its unlocked position seen in Figure 1.

From an examination of Figure 2 it will be noted that the end portions 26 and 28 of the shackle 16 are within the housing in the locked position as well as in the unlocked position indicated in broken line at 26' and 28'. Similarly, the pairs of bearings illustrated at 40 in the locked position and the pairs of bearings denoted as 40' indicating the unlocked position are always within the housing and in engagement with the inner surfaces of the internal groove 22.

The bearings 40 are embedded in the shackle 16 in a conventional manner by providing bored recesses as seen in Figure 4 to receive the balls 40 and the edge surfaces of the recesses are upset or peened to hold the bearings in position. Once the shackle 16 is assembled in the lock housing or body 14, the bearings 40 can be maintained in position by their continuous contact with the interior surface of the internal groove 22.

It will be seen that the bearings 40 serve to maintain the principal points of contact of the shackle 16 with the body 14 of the lock 10 which serves to minimize friction during movement of the shackle 16 relative to the body 14 and also to suppress any sounds or noises between the shackle 16 and body member 14 that might be caused by a loose fit.

I claim: